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October 12, 2000

VIA MESSENGER

Ms. Magalie Roman Salas, Secretary  
Federal Communications Commission  
445 12th Street, S.W., TW-A325  
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

RE: In the Matter of Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, ET Docket 98-153

Dear Ms. Salas:

Enclosed for filing in the above referenced proceeding is the original and four (4) copies of the Reply Comments of Delphi Automotive Systems Corporation.

Please date-stamp the enclosed extra copy of the cover sheet, marked for this purpose, and return in the self-addressed, postage-paid envelope which is provided.

If you have any questions regarding this filing, please do not hesitate to contact me.

Respectfully submitted,

Brett A. Snyder

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**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

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OFFICE OF THE SECRETARY**

In the Matter of )  
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Revision of Part 15 of the Commission's Rules )  
Regarding Ultra-Wideband Transmission )  
Systems )

ET Docket 98-153

**REPLY COMMENTS OF  
DELPHI AUTOMOTIVE SYSTEMS CORPORATION**

Delphi Automotive Systems Corporation ("Delphi"), by its undersigned attorneys, hereby submits these Reply Comments in response to the Notice of Proposed Rule Making ("NPRM") in the above-referenced docket.<sup>1</sup>

**I. DISCUSSION**

**A. The Commission Should Define UWB More Broadly So As Not To Reject Emissions Causing Less Interference Risk.**

As stated in its Comments, Delphi strongly believes the Commission should expand the definition of UWB by modifying its proposed bandwidth and waveform requirements. The Commission should expand its proposed definition of UWB because (1) there are many useful narrower band, non-impulse waveforms with emissions levels lower than those of devices the Commission would approve under the proposed minimum bandwidth requirement of 1.5 GHz; (2) it would be inequitable for companies that have been producing radar sensors under the Commission's current rules, such as Delphi, to be

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<sup>1</sup> See *Notice of Proposed Rule Making*, ET Docket 98-153, FCC 00-163 (rel. May 11, 2000).

disadvantaged under the Commission's proposed definition because their systems would not be able to operate in restricted bands; and (3) consumers will not be able to benefit from improvements in existing technology.

Delphi strongly believes that the Commission's proposed minimum bandwidth requirement of 1.5 GHz is too large. Specifically, Delphi believes the Commission should define UWB to include any device with emissions that occupy 500 MHz or more of spectrum, regardless of center frequency, because there are many useful waveforms with very low level emissions that would be precluded by the proposed minimum bandwidth requirement of 1.5 GHz. The interference levels of these narrower band devices can be controlled by average and peak power rules in conjunction with power spectral density limits in the same manner as proposed for devices with bandwidths in excess of 1.5 GHz. As discussed at pages 12–14 of Delphi's Comments, if the Commission does not lower its bandwidth requirements, it will reject devices with less interference potential than those it would accept.

Delphi also strongly reemphasizes its position that the definition of UWB should not be limited to impulse devices only. Making a rules change to allow only one type of RF modulation, *i.e.*, "pulse" or short duty cycle amplitude modulation, to qualify a device as "UWB" is not in the best interest of minimizing possible interference or of market competition. As discussed in its Comments, a variety of alternative, non-impulse waveforms transmit far less peak power and average power than devices the Commission proposes to approve in the NPRM. Delphi strongly recommends that new rules allow all modulation schemes provided that peak, average, and spectral density power limits are met.

A few commenters have stated that the definition of UWB should not include non-impulse waveforms. For example, Endress + Hauser GmbH & Co. (“Endress Hauser”) argues that devices utilizing Frequency Modulated Continuous Wave (“FMCW”) waveforms should not be included in the definition of UWB because “[FMCW] systems emit continuous emissions because a center frequency is shifted very slowly across a narrow bandwidth. The cumulative impact of this linear sweep could result in possible background noise, making it very dissimilar from true UWB systems.”<sup>2</sup> Similarly, the Aircraft Owners and Pilots Association (“AOPA”) stated: “[W]e suggest that the UWB characterization be limited to devices that solely use pulsed emissions where the bandwidth is directly related to the pulse width and shape. . . . Other techniques for producing very wide bandwidth emissions . . . are likely to have different characteristics with respect to their interference potentials. . . .”<sup>3</sup> Endress Hauser, however, does not offer any support for its opinion that FMCW “could” result in “possible” background noise, nor does Endress Hauser attempt to show why non-pulsed waveforms such as FMCW have a more severe impact on victim receivers than impulse devices. Delphi agrees with Endress Hauser and AOPA insofar as impulse and non-impulse devices may have different interference potentials. However, Delphi has explained in its Comments that many narrower band, non-impulse waveforms are in fact *less likely* to cause interference with victim receivers than impulse waveforms fitting the Commission’s proposed definition.<sup>4</sup>

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<sup>2</sup> Endress Hauser comments at 4.

<sup>3</sup> AOPA comments at 5.

<sup>4</sup> Delphi comments at 12-14.

Further, it would be inequitable for the Commission to exclude narrower band, non-impulse devices from the definition of UWB. Limiting the definition of UWB to impulse devices or to devices with a bandwidth of 1.5 GHz greatly disadvantages companies that have invested in developing RF sensor technology that is compliant with the Commission's current rules.

Because impulse-based radar systems generally require at least 1.5 GHz of bandwidth in their operation and because devices requiring such bandwidth would generally intrude into restricted frequency bands, Delphi made a deliberate business decision to focus on developing technology of similar application using narrower band waveforms that would comply with the Commission's rules.

The Commission's proposed bandwidth and waveform requirements would exclude such devices. If the proposed definition were adopted, impulse devices would be permitted to operate in restricted bands, while devices utilizing other wave forms would be unable to do so. Companies such as Delphi, which have developed narrower band, continuous wave technology will find themselves suddenly competing with devices operating in restricted bands. Consequently, companies such as Delphi, which have attempted to work within the current regulatory framework, would out of necessity be required to abandon their alternative, non-impulse sensor technology and would have to start from scratch to design impulse devices. Delphi's competitors, which have already begun to develop impulse devices over the past several years even though many of those devices have little chance of meeting existing rules, would have a distinct competitive advantage over Delphi.

Additionally, Delphi would be at a disadvantage to improve upon its current radar sensors if narrower band, non-impulse wave forms are excluded from the definition of UWB. Delphi's current radar bandwidths, made to "fit" within unrestricted frequency bands but adjacent to restricted bands, cannot be expanded without fundamental emissions into those restricted bands. If UWB is limited to wider band, impulse waveforms, the growth of technology already developed by Delphi under the current rules will be impeded.

Further, the inclusion of narrower band, non-impulse devices in the definition of UWB will decrease the cost of providing such devices to the consumer. As explained in its Comments,<sup>5</sup> Delphi, which has designed certain radar sensors for the European market, has had to develop devices utilizing other frequency bands for the same application in the United States because of restricted frequency bands. If the Commission were to include non-impulse devices in its definition of UWB, Delphi would be able to produce one device for both the U.S. and European markets, thereby decreasing the per unit cost of production. Producing sensors for the same application at different frequencies results in inherent production cost increases. This cost, of course, must be passed along to the consumer. Higher production costs mean that fewer consumers will purchase the radar systems, with the result that fewer collisions are avoided overall.

**B. The Commission Should Not Confine UWB to GPRs and WIDs Only.**

The U.S. GPS Industry Council ("GPS Council") has urged the Commission to distinguish between two classes of UWB devices. The first is a class comprised of Ground

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<sup>5</sup> *Id.* at 16.

Penetrating Radars (GPRs) and through-the-wall imaging devices (“WIDs”) only. The second is comprised of all other UWB devices, including all other types of UWB radar and all UWB communications devices.<sup>6</sup> Specifically included in the second class are UWB collision avoidance radars,<sup>7</sup> such as those produced by Delphi. The GPS Council argues that the second class of devices should be addressed in a later proceeding. The GPS Council attempts to distinguish the two classes because the first uses single emitters, while the second “often involves licensing of networks.”<sup>8</sup> While the GPS Council concedes that radar devices such as GPRs and WIDs may be compatible with GPS receivers if such devices operate above 3 GHz,<sup>9</sup> it is concerned with UWB communications devices which can be networked, and thus, present problems regarding the regulation of peak power in a localized area.

Although the GPS Council would lump UWB automotive radars with UWB communications devices, its reasons for doing so are unclear. The GPS Council’s primary concern regarding UWB communications devices is that such devices can be networked and that, consequently, many devices operating in tandem within a localized area could have unforeseen interference effects. However, automotive radars of the type produced by Delphi are not networked and are not concentrated in one local area as UWB communications devices might be. Further, the GPS Council’s chief overall concern appears to be utilization of the spectrum under 3 GHz. As explained in its comments,

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<sup>6</sup> GPS Council comments at 22.

<sup>7</sup> *Id.* at 18.

<sup>8</sup> *Id.* at 22.

<sup>9</sup> *Id.* at 23.

however, many radar devices produced by Delphi do not operate below 3 GHz. Such devices, therefore, apparently even according to the GPS Council, do not pose the potential risks to GPS operation that the GPS Council has discussed. Delphi believes, therefore, that the Commission should not adopt the GPS Council's position to exclude all devices which are not GPRs or WIDs from this stage of the proceeding when there is no good reason to do so and such exclusion will prevent highly beneficial devices from entering the market.

Further, as Delphi stated in its Comments, the Commission should not attempt to make a determination regarding frequency of operation below 2 GHz until adequate testing of interference potential has been performed and commented upon. Additionally, Delphi believes that the Commission should not attenuate general emission limits below 2 GHz before adequate testing has been performed and the Commission has received comments on such tests.

**C. The Commission should limit absolute peak power emission to 30 dB above the permitted average emission level.**

As Delphi stated in its Comments, Delphi agrees with the Commission that the peak power of UWB devices should be limited and Delphi supports the use of both proposed peak power measurements and the concept of a variable absolute peak power limit in proportion to the amount the emission's bandwidth exceeds 50 MHz. Delphi agrees with the Commission in maintaining the existing 20 dB limit for measurements in a 50 MHz bandwidth.

Because detailed knowledge of all types of receivers and all possible interference mechanisms is not known, additional analysis and testing is required. Delphi reemphasizes



its recommendation of a more conservative approach to “absolute peak” emissions limits, *i.e.*, the “absolute peak” emissions, as measured over the entire emission bandwidth, should be no more than 30 dB above the average limit, regardless of the emission total bandwidth. This would minimize the number of devices radiating at higher power and reduce the possibility of encountering unexpected interference. Delphi believes that the Commission must guard against extremely high power, extremely short duration pulse emissions because such emissions may overload the wideband (microwave) sections of otherwise narrowband receivers. Delphi has shown that effective automotive radar can be readily designed within current Commission emissions limits.

Delphi also suggests that, for frequencies greater than 2 GHz, if the peak power exceeds the current 20 dB limit<sup>10</sup> the Commission should consider requiring the center frequency of the emission to occupy existing bands already allocated to higher-power operations. Since the highest power levels will occur at the center frequency, the interference potential will be minimized since higher power transmitters already exist in these bands. Delphi also suggests that the Commission require center frequency stability to be maintained within current higher-power bands.

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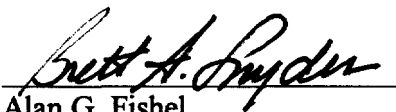
<sup>10</sup> See 47 C.F.R. § 15.35(b).

## II. CONCLUSION

For the reasons set forth herein, the Commission should adopt rules consistent with the comments and proposals of Delphi.

Respectfully submitted,

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Its Attorney

Dated: October 12, 2000

## **CERTIFICATE OF SERVICE**

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